

AT



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/935,255	08/22/2001	Ronald A. Weimer	MTI-31529	1208

31870 7590 01/11/2005

WHYTE HIRSCHBOECK DUDEK S.C.
 555 EAST WELLS STREET
 SUITE 1900
 MILWAUKEE, WI 53202

EXAMINER

CHEN, JACK S J

ART UNIT PAPER NUMBER

2813

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/935,255	WEIMER, RONALD A.	
	Examiner	Art Unit	
	Jack Chen	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-57 and 73-121 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) ____ is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 1-57, 73-121 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

The Office Action dated on 6 June 2004 is withdrawn upon further reconsideration of the instant application and in view of the communication dated on 28 October 2004. Claims 1-57 and 73-121 are active in this application.

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-27, 73-85 and 97-112, drawn to method for forming nitride barrier layer, classified in class 148, subclass 33.3.
 - II. Claims 28-41, drawn to method for forming nitride barrier layer in a semiconductor device, classified in class 438, subclass 791.
 - III. Claims 42-57, 86-96 and 113-121, drawn to method for forming a transistor gate stack having a nitride barrier layer in the gate dielectric, classified in class 438, subclass 585.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I, II and III are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention I has separate utility such as a barrier layer to protect metal cutting tools from corrosion due to moisture. Invention II has separate utility such as a barrier layer to prevent hydrogen diffusion into a high-k ferroelectric capacitor (FeRAM) during hydrogen annealing. See MPEP § 806.05(d).

Art Unit: 2813

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. Because these inventions are distinct for the reasons given above and the search required among the groups is divergent, restriction for examination purposes as indicated is proper.

5. This application contains claims directed to the following patentably distinct species of the claimed invention:

Should Applicant elect the invention of Group I, then one from each of the following groups must be elected:

IA. Method for forming silicon layer (see specification, pp. 2, 6-7)

IA-1. PECVD

IA-2. LPCVD

IA-3. RTCVD

IA-4. Thermal CVD

IA-5. CVD

IB. Method for forming nitride barrier layer (See specification, pp. 7)

IB-1. by thermally annealing in nitrogen-containing species (i.e., see abstract section)

IB-2. by exposing to plasma source (i.e., see abstract section)

IC. Silicon (See specification, pp. 2, 6)

IC-1. Polysilicon

IC-2. Amorphous silicon

ID. Dielectric layer (See specification, pp. 6)

Art Unit: 2813

ID-1. Silicon dioxide

ID-2. Tantalum pentoxide

ID-3. Hafnium dioxide

ID-4. Aluminum trioxide

IE. Silicon source materials (See specification, pp. 6)

IE-1. SiH₂

IE-2. Si₂H₇

IE-3. SiH₂Cl₂

IE-4. SiCl₄

IE-5. SiH₄

IE-5. Si₂H₆

Currently, no claim is generic to the invention of Group I. Applicant is referred to MPEP 806.04(c) and 806.04(d) for the definition of a generic claim.

Should Applicant elected the invention of IB-1 (Nitrogen-containing gases) within IB, then one of the following species must be elected:

IB-1-1. Using N₂ as the nitrogen-containing gas

IB-1-2. Using NH₃ as the nitrogen-containing gas

IB-1-3. Using NF₃ as the nitrogen-containing gas

IB-1-4. Using NO_x as the nitrogen-containing gas

IB-1-5. Using Nitrogen oxide as the nitrogen-containing gas

IB-1-6. Using Nitrogen and Helium mixture as the nitrogen-containing gas

Should Applicant elected the invention of IB-2 (plasma source) within IB, then one of the following species must be elected:

IB-2-1. Downstream microwave system

IB-2-2. Electron cyclotron resonance system

IB-2-3. Inductive coupled plasma system

IB-2-4. Radio frequency system

IB-2-5. Remote microwave plasma source

Should Applicant elected the invention of Group II, then one from each of the following groups must be elected:

IIA. Method for forming silicon layer (see specification, pp. 2, 6-7)

IIA-1. PECVD

IIA-2. LPCVD

IIA-3. RTCVD

IIA-4. Thermal CVD

IIA-5. CVD

IIB. Method for forming nitride barrier layer (See specification, pp. 7)

IIB-1. by thermally annealing in nitrogen-containing species (i.e., see abstract section)

IIB-2. by exposing to plasma source (i.e., see abstract section)

IIC. Silicon (See specification, pp. 2, 6)

IIC-1. Polysilicon

Art Unit: 2813

IIC-2. Amorphous silicon

IID. Dielectric layer (See specification, pp. 6)

IID-1. Silicon dioxide

IID-2. Tantalum pentoxide

IID-3. Hafnium dioxide

IID-4. Aluminum trioxide

IIE. Silicon source materials (See specification, pp. 6)

IIE-1. SiH₂

IIE-2. Si₂H₇

IIE-3. SiH₂Cl₂

IIE-4. SiCl₄

IIE-5. SiH₄

IIE-5. Si₂H₆

Currently, no claim is generic to the invention of Group II. Applicant is referred to MPEP 806.04(c) and 806.04(d) for the definition of a generic claim.

Should Applicant elect the invention of IIB-1 (Nitrogen-containing gases) within IIB, then one of the following species must be elected:

IIB-1-1. Using N₂ as the nitrogen-containing gas

IIB-1-2. Using NH₃ as the nitrogen-containing gas

IIB-1-3. Using NF₃ as the nitrogen-containing gas

IIB-1-4. Using NO_x as the nitrogen-containing gas

IIB-1-5. Using Nitrogen oxide as the nitrogen-containing gas

IIB-1-6. Using Nitrogen and Helium mixture as the nitrogen-containing gas

Should Applicant elected the invention of IIB-2 (plasma source) within IIB, then one of the following species must be elected:

IIB-2-1. Downstream microwave system

IIB-2-2. Electron cyclotron resonance system

IIB-2-3. Inductive coupled plasma system

IIB-2-4. Radio frequency system

IIB-2-5. Remote microwave plasma source

Should Applicant elected the invention of Group III, then one from each of the following groups must be elected:

IIIA. Method for forming silicon layer (see specification, pp. 2, 6-7)

IIIA-1. PECVD

IIIA-2. LPCVD

IIIA-3. RTCVD

IIIA-4. Thermal CVD

IIIA-5. CVD

IIIB. Method for forming nitride barrier layer (See specification, pp. 7)

IIIB-1. by thermally annealing in nitrogen-containing species (i.e., see abstract section)

IIIB-2. by exposing to plasma source (i.e., see abstract section)

IIIC. Silicon (See specification, pp. 2, 6)

Art Unit: 2813

IIIC-1. Polysilicon

IIIC-2. Amorphous silicon

IIID. Gate dielectric/oxide (See specification, pp. 6)

IIID-1. Silicon dioxide

IIID-2. Tantalum pentoxide

IIID-3. Hafnium dioxide

IIID-4. Aluminum trioxide

IIIE. Silicon source materials (See specification, pp. 6)

IIIE-1. SiH₂

IIIE-2. Si₂H₇

IIIE-3. SiH₂Cl₂

IIIE-4. SiCl₄

IIIE-5. SiH₄

IIIE-5. Si₂H₆

IIIF Gate stacks (see specification, pp. 7-8)

IIIG-1. Oxide/nitride/polysilicon

IIIG-2. Oxide/nitride/polysilicon/nitride

IIIG-3. Oxide/nitride/polysilicon/barrier

IIIG-4. Oxide/nitride/polysilicon/barrier/metal

IIIG-5. Oxide/nitride/polysilicon/barrier/metal/nitride

IIIG-6. Oxide/nitride/polysilicon/metal silicide

IIIG-7. Oxide/nitride/polysilicon/metal silicide/nitride

Art Unit: 2813

Currently, no claim is generic to the invention of Group III. Applicant is referred to MPEP 806.04(c) and 806.04(d) for the definition of a generic claim.

Should Applicant elected the invention of IIIB-1 (Nitrogen-containing gases) within IIIB, then one of the following species must be elected:

IIIB-1-1. Using N₂ as the nitrogen-containing gas

IIIB-1-2. Using NH₃ as the nitrogen-containing gas

IIIB-1-3. Using NF₃ as the nitrogen-containing gas

IIIB-1-4. Using NO_x as the nitrogen-containing gas

IIIB-1-5. Using Nitrogen oxide as the nitrogen-containing gas

IIIB-1-6. Using Nitrogen and Helium mixture as the nitrogen-containing gas

Should Applicant elected the invention of IIIB-2 (plasma source) within IIIB, then one of the following species must be elected:

IIIB-2-1. Downstream microwave system

IIIB-2-2. Electron cyclotron resonance system

IIIB-2-3. Inductive coupled plasma system

IIIB-2-4. Radio frequency system

IIIB-2-5. Remote microwave plasma source

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable

Art Unit: 2813

thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

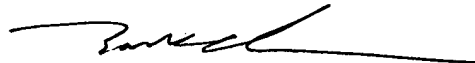
Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Chen whose telephone number is (571)272-1689. The examiner can normally be reached on Monday-Friday (9:00am-6:30pm) alternate Monday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W Whitehead can be reached on (571)272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jack Chen
Primary Examiner
Art Unit 2813